

FLIGHT ATTENDANT INJURIES
1971-1976

Donell M. Pollard
Earl D. Folk
Richard F. Chandler

Civil Aeronautical Institute
Federal Aviation Administration
Oklahoma City, Oklahoma



January 1982

Document is available to the public through the
National Technical Information Service
Springfield, Virginia 22161

Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Office of Aviation Medicine
Washington, D.C. 20501

DTIC FILE COPY

DTIC
ELECTE
MAY 2 1982

Technical Report Documentation Page

1. Report No. FAA-AM-82-8	2. Government Accession No. AD-A114909	3. Recipient's Catalog No.	
4. Title and Subtitle FLIGHT ATTENDANT INJURIES: 1971-1976		5. Report Date January 1982	
		6. Performing Organization Code	
7. Author(s) Donell W. Pollard, Earl D. Folk and Richard F. Chandler		8. Performing Organization Report No.	
9. Performing Organization Name and Address FAA Civil Aeromedical Institute P. O. Box 25082 Oklahoma City, Oklahoma 73125		10. Work Unit No. (TRIS)	
		11. Contract or Grant No.	
12. Sponsoring Agency Name and Address Office of Aviation Medicine Federal Aviation Administration 800 Independence Avenue, S.W. Washington, D.C. 20591		13. Type of Report and Period Covered	
15. Supplementary Notes Reported research was conducted under task AM-B-81/82-PRS-22.		14. Sponsoring Agency Code	
<p>16. Abstract</p> <p>Data from 206 reports of 377 flight attendant injuries occurring from 1971 through 1976 are summarized. These data were obtained from the Cabin Safety Data Bank of the Civil Aeromedical Institute, and are based on Federal Aviation Administration and National Transportation Safety Board accident/incident reports. Information relating to the severity and location of the injury is provided when available from original reports. Data relating to the flight condition and location in the aircraft where the injury occurred are provided. Summaries of each reported injury are included in the appendices.</p>			
17. Key Words Airline Flight Attendant Injuries		18. Distribution Statement Document is available to the public through the National Technical Information Service, Springfield, Virginia 22161	
19. Security Classif. (of this report) Unclassified	20. Security Classif. (of this page) Unclassified	21. No. of Pages 54	22. Price

ACKNOWLEDGMENTS

The work and dedication of the many field personnel who investigated the occurrences and collected information is acknowledged.

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
HISTORY	1
METHODS	1
RESULTS	2
DISCUSSION	12
CONCLUSION	18
REFERENCES	54
APPENDIX A. Flight Attendant Injuries in Turbulence 1971-1976	19
APPENDIX B. Flight Attendant Injuries in In-Flight Incidents Other Than Turbulence 1971-1976	33
APPENDIX C. Flight Attendant Injuries in Non-Impact Ground Accidents 1971-1976	39
APPENDIX D. Flight Attendant Impact Injuries in Survivable Accidents 1971-1976	43
APPENDIX E. Abbreviations and Definitions	48
APPENDIX F. Sample Industry Reports of Flight Attendant Injuries	53



Accession For	
DTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
Distribution/	
Availability Codes	
Avail and/or	
Dist	Special

LIST OF TABLES

<u>TABLE</u>		<u>PAGE</u>
1	Numbers and Types of Incidents and Injuries	2
2	Turbulence-Related Injuries	4
3	Turbulence Injuries	4
4	Non-Turbulence In-Flight Incidents	6
5	Non-Turbulence In-Flight Injuries	7
6	All In-Flight Injuries	7
7	Non-Impact Ground Injuries	9
8	Percentage of Incidents/Injuries	9
9	Comparison of Number and Severity of Injuries by Type of Incident and Position in Aircraft	10
10	Summary of Number of Injuries by Type and Severity at Given Locations in Aircraft	11
11	Types of In-Flight Injuries	12
12	Percentage of Minor and Serious Injuries by Type of Incident and Position in Aircraft	14
13	Percentage of Total Injuries Occurring at Given Locations During Different Types of Incidents	15
14	Percentages of Total Injuries by Type and Severity at Given Locations In Aircraft	16
15	Percent of Total Injuries	16
16	Percent of All Injuries at Position in Aircraft	17
17	Percent of All Injuries By Location of Injury	17

FLIGHT ATTENDANT INJURIES: 1971-1976

Introduction

Flight attendants are one of the primary safety factors during in-flight and ground emergencies (1). They provide leadership in the cabin and perform emergency duties, including the administering of first aid, fighting in-flight fires, and evacuating passengers from disabled aircraft. Any injury to a flight attendant may adversely influence the safety of the other occupants of the aircraft. This examination of accident/incident histories provides information about duty-related U.S. airline flight attendant injuries occurring in 1971-1976. It is intended to illustrate the operational and situational factors relative to those injuries and to aid those persons interested in improving methodology for prevention or treatment of such injuries.

The reported injuries used in preparing this examination are individually summarized in Appendices A through D.

History

The flight attendant profession began when nurse Ellen Church visited the Boeing Air Transport Office on February 23, 1930, and persuaded management personnel they needed someone to fly in the cabin of the airplanes to take care of the needs of the passengers. Recognizing the role the flight attendants might be called upon to play in the health and safety of the passengers, she decided that part of the hiring requirements would be that they be registered nurses. Because of the military demand for nurses during World War II the requirement was subsequently dropped.

Following World War II the hiring requirements emphasized small size, charm, and youth, rather than nurses' training. Flight attendant instruction emphasized passenger service, conversational skills, and grooming, with only basic training in first aid and emergency procedures. However, the emphasis on crashworthiness and the safety role of flight attendants were given additional impetus following a series of accidents in the early sixties. Accident investigators hypothesized that much injury and loss of life in these accidents were related to the crashworthiness characteristics of the aircraft and inadequacy of the training of the flight attendants involved. At this time more airlines began to increase the amount of safety training given the flight attendants. Concurrently, the Federal Aviation Administration (FAA) initiated a program to review and upgrade cabin safety in air carrier operations (2).

Methods

The Federal Aviation Act of 1958 (3) establishes responsibilities for investigation of all accidents and incidents. The definitions of accident, incident, injury classification, substantial structural damage, and survivable accident are contained in FAA Order 8020.11*. This, along with the

*See Appendix E.

Department of Transportation Act of 1966 (4), and the Independent Safety Board Act of 1974 (5), gives the National Transportation Safety Board (NTSB) authority to delegate a portion of its accident/incident investigation to the FAA. Under this authority the NTSB personnel investigate the more serious occurrences, while FAA personnel investigate most of the incidents and those accidents where the damage or injury is not extensive. However, as noted in a NTSB special study (6), "Apparently, crewmembers made individual decisions that a mishap merited a report, and prepared the necessary forms and statements. A comparison of FAA files and files of flight crew associations indicated that many in-flight injuries reported to the associations were not reported to the FAA. This suggests that the reporting process was not complete, thus resulting in the loss of valuable data. Also, data could have been lost if an in-flight mishap was not first classified properly as an accident. In such cases, flight data recorder readouts and information regarding severity of injuries and location of the injured were lacking." Furthermore, although detailed information regarding the nature and severity of injuries is always desirable for many purposes, operational constraints dictate that the injury reports, when made, are accomplished by personnel with little or no medical background.

The experience gained while developing the Civil Aeromedical Institute (CAMI) Cabin Safety Data Bank (7) and upon which the present report is based, indicates the incompleteness in the reporting process and other deficiencies still exist. Thus, the data in the present study should not be considered complete for computing incident rates or statistics. However, this study presents an assembly of flight attendant injury information as is available in the official records and provides useful descriptions of those occurrences.

Results

Table 1 enumerates the incidents and injuries considered in this report.

TABLE 1. Numbers and Types of Incidents and Injuries

Types of Incidents	No. of Incidents	No. of Injuries
Turbulence	120	233
Non-Turbulence In Flight	52	79
Non-Impact Ground	21	34
Impact (Survivable)	13	31*
TOTAL	206	377

*Six fatalities occurred in addition to the 31 injuries.

Turbulence Injuries. For purpose of this investigation, a "turbulence injury" occurred when a flight attendant was injured when an aircraft entered turbulent air. An example of a "turbulence" incident is provided by the Western Airlines occurrence on June 12, 1976, when a Boeing 727-200, cruising at an altitude of 23,000 feet, 85 nautical miles west of Minneapolis-St. Paul, encountered severe turbulence associated with clouds. The seat-belt sign was illuminated, the captain had advised the flight attendants in the forward cabin to take their seats and an announcement was made for all flight attendants and passengers to take their seats because of the possibility of turbulence. The copilot estimated the aircraft experienced light to moderate turbulence for 5 to 6 minutes before the severe turbulence was encountered. The severe turbulence was of short duration and essentially consisted of two sharp jolts. The flight attendants heard the public address system announcement telling the passengers and flight attendants to be seated. A male flight attendant, who was subsequently injured, was returning to the galley area but had stopped and had bent over to secure his suitcase when the turbulence was encountered. This flight attendant sustained numerous contusions, abrasions and cuts. Following the landing he was examined at a hospital and released. Another flight attendant was securing galley equipment when the turbulence was encountered; he suffered a fractured thoracic vertebra.

Another example of flight attendant injury during turbulence is provided by an accident which occurred on September 21, 1974. The captain of a United Boeing 727 had illuminated the seatbelt sign because he anticipated that turbulence would be associated with thunderstorms in the vicinity. However, the flight attendant left her seat to begin her duties, fell during the turbulence and sustained a fracture at the ankle. Fifty-eight percent of all the occurrences reported in this study are turbulence-related, and they resulted in 61 percent of the total number of injuries. Further classification of injuries reveals this category contains 65 percent of the minor injuries and 50 percent of the serious injuries. The reports for 38 percent of these turbulence-related occurrences did not provide information about the location in the aircraft where the injury occurred; however, 27 percent of the reports indicated that the flight attendant was in the aisle. The galley location was the next largest category with 17 percent.

Table 2 provides information about the number and severity of injuries, by location in the aircraft, in turbulence incidents.

The "standing" category was difficult to define because a flight attendant standing usually means in the aisle; however, examination of the reports indicated that occasionally the term "standing" might indicate in the galley or in the vicinity of the flight attendant seats.

Table 3 provides information about turbulence-related injury relative to the location in the airplane where it occurred. When one individual sustained more than one injury, each injury was listed, and when several flight attendants were injured during the same incident each injury was counted on this table.

TABLE 2. Turbulence-Related Injuries

Location in Aircraft	Number of Incidents	Number of Minor Injuries	Number of Serious Injuries	Total Injuries
Not Given	46	64	16	80
Aisle	32	56	14	70
Galley	20	16	11	27
Seats	10	10	3	13
Standing	13	36	5	41
Other Locations	2	2	0	2
TOTAL	123*	184	49	233

*In three incidents, injuries occurred in more than one location.

TABLE 3. Turbulence Injuries

Location of Injury	Position in Aircraft at Time of Injury										Total	
	Not Given		Aisle		Galley		Seats		Standing			
	M	S	M	S	M	S	M	S	M	S	M	S
Extremities	3	2	6	3	2				2		9	9
Torso or Spinal Column	5	1	2	2	4	2	3	2	9	2	23	9
Head	5		7		5	2			2		19	2
Not Given or General												
Bruises/Cuts	16		18		3	1	1				38	1
Burns	1		5		1						7	
Unknown	34	13	18*	9	3	4	6	1	27	1	88	28
Total	64	16	56	14	16	11	10	3	38	5	184	49

M - Minor injuries

S - Serious Injuries

*Two with carts.

The information in Table 3 indicates that 30 percent of the injuries occurred while the flight attendant was in the aisle. A review of the accident/incident reports indicates that many times the flight attendant was in this location serving, picking up service items or checking to see if the passengers had their seatbelts fastened, when the turbulence occurred and the flight attendant was injured. However, most of the reports do not contain enough information to reach a definite conclusion about the duties being performed when the injury occurred. Eighty-three percent of the injuries occurred in these three locations: aisle, not given, and standing. This includes 71 percent of the serious injuries and 86 percent of the minor injuries. Twelve percent of the injuries occurred in the galley, including 9 percent of the minor injuries and 22 percent of the serious injuries. Information about the duty being performed in the galley, when available, indicates that the duty performed was "serving." Six percent of the turbulence-related flight attendant injuries occurred in the vicinity of the flight attendant seat and 6 percent of all serious injuries and 5 percent of all minor injuries occurred at this location. The usual seat-related activity was associated with trying to get into the seat and fasten the restraint system in anticipation of turbulence.

Seventy-nine percent of the injuries are classified as minor. Of these, 21 percent consist of bruises, cuts and abrasions. Thirteen percent of the minor injuries were to the torso and spinal column and consisted of injuries such as sprained backs, sore necks and ribs, and other injuries recorded as "minor injuries to ribs or back or neck." The accident/incident reports do not provide information about the nature of 48 percent of the minor injuries and 57 percent of the serious injuries. When the data about the nature of both serious and minor injuries are provided, it indicates that 15 percent occurred to the extremities and were usually fractures while 27 percent were torso and spinal column injuries (usually fractured vertebrae).

This examination indicates that when information about the nature and location of serious turbulence-related flight attendant injuries was reported, the most common serious injuries appear to be fractures. These have occurred at all locations in the aircraft.

Non-Turbulence In Flight-Injuries. Twenty-five percent of the accidents/incidents in which flight attendants were injured occurred in non-turbulence flight. Typical examples of the type of occurrence are provided by an incident which occurred on April 17, 1973, where 2 flight attendants sustained minor back strain when the captain initiated evasive maneuvers to avoid collision with another aircraft; the August 28, 1973, accident when a "violently porpoising" autopilot caused 1 serious flight attendant injury, 21 serious passenger injuries and 1 passenger fatality; and the August 31, 1974, accident when a flight attendant sustained a second-degree burn when sprayed in the eye and on the side of the face by hot coffee.

A summary of the type and number of non-turbulent in-flight accidents/incidents is provided by Table 4.

TABLE 4. Non-Turbulence In-Flight Incidents

<u>Type of Incident</u>	<u>Number of Incidents</u>
Galley Component Involved	11
Maneuvering of Aircraft	11
Unruly Passenger	7
Coffeemaker	7
Slip or Fall	4
Personnel Lift or Elevator	4
Flight Attendant Seat Performance	3
Action by Flight Attendant	2
Decompression	2
Cabin Item Striking Flight Attendant	1
	<hr/>
TOTAL	52

Total meal-service-related injuries can be derived by adding the 7 coffeemaker-involved incidents to the 11 galley-component-involved incidents. These 18 incidents comprise 35 percent of the in-flight, non-turbulence occurrences. Eleven incidents (or 21 percent) in which maneuvering the aircraft was responsible for the injury is the second largest event followed by the category in which the flight attendants were injured because of the actions of unruly passengers. Detailed information about these incidents is contained in Appendix B.

Table 5 provides information about non-turbulence-related in-flight injuries relative to the location in the airplane where the injuries occurred. This information is comparable to information in Table 3 for turbulence-related injuries. As before, multiple injuries to one person are tabulated as individual injuries in this table.

Forty-four percent of all the in-flight injuries are listed in the "standing" category, which represents 41 percent of the minor injuries and 56 percent of the serious injuries. The second largest group, injuries occurring in the "galley," has 37 percent of the total injuries, including 37 percent of the minor injuries and 38 percent of the serious injuries.

TABLE 5. Non-Turbulence In-Flight Injuries

Location of Injury	Position in Aircraft at Time of Injury										Total	
	Not Given		Aisle		Galley		Seats		Standing			
	M	S	M	S	M	S	M	S	M	S	M	S
Extremities					8	1	2	1	1	1	11	3
Torso or Spinal Column	2				1		1			1	4	1
Head					4	1			2		6	1
Not Given or General												
Bruises/Cuts	1		1		8				8		18	
Burns			2		2	3					4	3
Unknown	1					1	4		15	7	20	8
Total	4		3		23	6	7	1	26	9	63	16

Table 6 combines the information for "turbulence" and "non-turbulence" in-flight injuries.

TABLE 6. All In-Flight Injuries

Location of Injury	Position in Aircraft at Time of Injury								Total M S			
	Not Given M S		Aisle M S		Galley M S		Seats M S				Standing M S	
Extremities	3	2	6	3	8	3	2	1	1	3	20	12
Torso or Spinal Column	7	1	2	2	5	2	4	2	9	3	27	10
Head	5		7		9	3			4		25	3
Not Given or General												
Bruises/Cuts	17		19		11	1	1		8		56	1
Burns	1		7		3	3					11	2
Unknown	35	13	18	9	3	5	10	1	42	8	108	36
Total	68	16	59	14	39	17	17	4	64	14	247	65

Twenty-three percent of all the injuries and 22 percent of the serious injuries occurred while the flight attendant was in the aisle. However, both the "not given" location with 25 percent and the "galley" location with 26 percent had more serious injuries. Fifty-five percent of the time, the location of the serious injury was not given. The largest classification (18 percent) where the location of injury is provided is that of serious injuries which occur to the extremities. The next largest category of serious in-flight injuries is the one representing torso and spinal column injuries, which contains 15 percent of the serious in-flight flight attendant injuries. Available information indicates that the most common in-flight flight attendant injury is categorized as minor, and consists of cuts and bruises, inflicted during turbulence while the flight attendant is in the aisle. Twenty-one percent of the in-flight injuries are serious and occur with almost equal frequency in the aisle, the galley, or while the flight attendant is standing in other locations. These serious injuries occur most often to the limbs or in the torso/spinal column area.

Non-Impact Ground Injuries. The next group of flight attendant injury occurrences is classified as "non-impact ground" injuries in order to separate it from the more serious crash injuries. A typical example of this type of occurrence is provided by the incident which occurred on December 12, 1974, when, during an emergency aircraft evacuation, four flight attendants sustained minor injuries. Further examples are contained in Appendix C. Table 7 provides information about the location and severity of injuries sustained in non-impact ground occurrences.

In the non-impact ground accidents/incidents 91 percent of the injuries are minor and 58 percent of these occur in the "standing" position. Serious burn injuries in this category occurred when a portable oxygen tank exploded and seriously burned the flight attendants.

Survivable Impact Injuries. The final classification considers injuries in the survivable impact accident. These injuries are summarized in Appendix D. An example of this type of accident is provided by the Boeing 737, which crashed while making a localizer approach for landing, and 40 of the 55 passengers sustained fatal injuries. The flight attendant seated in the forward seat sustained multiple contusions and a bilateral fracture at the ankles. The two flight attendants seated in the rear of the aircraft sustained minor injuries.

The 7 minor and 24 serious injuries in this category are of the type usually associated with impact and all were sustained at the flight attendant's seat with the exception of one injury which occurred while the flight attendant was in the galley. This category also contains the six flight attendant fatalities in survivable accidents. All of the crashes occurred during the landing phase of the flight operation (five during approach, two ran off the runway and one an unsuccessful go-around).

Tables 8, 9, and 10 provide summary information about all types of incidents and the numbers, location and severity of the injuries.

TABLE 7. Non-Impact Ground Injuries

Location of Injury	Position in Aircraft at Time of Injury										Total	
	Not Given		Aisle		Galley		Seats		Standing*			
	M	S	M	S	M	S	M	F	M	S	M	S
Extremities			1		3	1			2		6	1
Torso or Spinal Column												
Head			1		1						2	
Not Given or General												
Bruises/Cuts			1		1		1				3	
Burns			1	1				1			1	2
Unknown			3						16		19	
Total			7	1	5	1	1	1	18		31	3

*Includes emergency evacuation injuries.

TABLE 8. Percentage of Incidents/Injuries

Type of Incident	Percent of Total Incidents	Percent of Total Minor Injuries	Percent of Total Serious Injuries
Turbulence	58.3	64.6	53.3
In-Flight Non-Turbulence Related	25.2	22.1	17.4
Non-Impact Ground	10.2	10.9	3.3
Impact	6.3	2.5	26.0*
Total Percentage	100	100	100
Total N=	206	285	92

*Six fatalities occurred in addition to these injuries.

TABLE 9. Comparison of Number and Severity of Injuries by
Type of Incident and Position in Aircraft

Position in Aircraft Number of Injuries	Type of Incident									
	Turbulence			In-Flight			Ground			Total
	M	S		M	S		Non-Impact	Survivable Impact		
Not Given, N =	64	16		4						68 16
Aisle, N =	56	14		3			7 1			66 15
Galley, N =	16	11		23	6		5 i	1		44 19
Seats, N =	10	3		7	1		1 1	7		23 25 28
Standing, N =	38	5		26	9		18			82 14
Total, N =	184	49		63	16		31 3	7		24 285 92
GRAND TOTAL N =	233			79			34	31		377

TABLE 10. Summary of Number of Injuries by Type
and Severity at Given Locations in Aircraft

Location and Severity of Injury	Position in Aircraft											
	Not Given		Aisle		Galley		Seats		Standing		Total	
	M	S	M	S	M	S	M	S	M	S	M	S
Extremities, N =	3	2	7	3	11	4	4	14	3	3	28	26
Torso/Spinal Column, N =	7	1	2	2	5	3	7	7	9	3	30	16
Head, N =	5		8		10	3		2	4		27	5
Not Given or General												
Bruises/Cuts, N =	17		20		12	1	2		8		59	1
Burns, N =	1		8	1	3	3		1			12	5
Unknown, N =	35	13	21	9	3	5	12	4	58	8	129	39
Total N =	68	16	66	15	44	19	25	26	82	14	285	92
TOTAL N =	84		81		63		53		96		377	

Types of In-Flight Injuries. The types of injuries which occur in flight are of special interest because ground based treatment facilities are not readily available. To aid in planning for such emergencies, it would be desirable to have precise data on the types of injuries which have occurred in the past. Unfortunately, such data are not generally accessible. Table 11 lists those types of injuries described in the reports reviewed for this analysis. As might be expected, most injuries can be classified as cuts, bruises, sprains or pains, and would require little treatment beyond basic first aid. Some cuts were serious, as for example when 1 inch was cut from the tip of a finger caught in a jumpseat, or when hospitalization was required after a severe knee laceration. Likewise, more serious burns can occur, usually as a result of incidents involving hot beverages being prepared in the galley. Fourteen fractures were identified, primarily of the extremities, but occasionally involving vertebrae or the pelvis. Twenty-one incidents of concussion, unconsciousness or impact to the head were reported. Most of these were minor, but included one broken nose.

TABLE 11. Types of In-Flight Injuries

Reported Injury	Turbulence		Non-Turbulence	
	M	S	M	S
Concussion *	13	1	6	1
Fractures				
vertebrae		4		1
pelvis		1		
extremities		7		1
Cuts	14	1	8	1
Burns	5		4	3
Contusions	25		12	
Sprains/Pains	29	2	8	

*Includes unconsciousness or "impact to the head."

Discussion

The position in the aircraft at which flight attendants are injured is seldom clearly reported, making this factor difficult to evaluate. For example, when the original accident/incident form states the flight attendants were "up" "standing," performing duties associated with service, it is not clear where they were located in the airplane. Many times when an original report states the flight attendant was injured in the galley it

often fails to specify which galley. A NTSB special report (4) provides a hierarchy of risk potential for flight attendants and passengers. The order of risk, listed highest to lowest, is:

1. working in rearmost galley
2. in lavatory
3. waiting in lavatory area
4. standing in lounge/bar area
5. standing/walking in aftmost rear cabin area
6. seated with belt loosely fastened aft portion of rear cabin
7. standing/walking--forward portion of rear cabin
8. working in forward galley
9. working in mid-cabin galley
10. standing/walking--forward cabin
11. seated with seatbelt loosely fastened--forward cabin
12. seated with seatbelt snugly fastened--forward cabin

The categorization of locations in this study was done differently from the NTSB effort; however, the results seem to be in general agreement.

The results of this study can provide data pertinent to several aspects of problems relating to cabin attendant injuries. For example, Tables 12 and 13 have been constructed to indicate the distribution and severity of injuries according to the position in the aircraft where the injury occurred or the condition of the flight at time of injury. These tables can be interpreted to provide information such as "52.3 percent of the minor injuries during in-flight non-turbulence related incidents occurred in the galley" (Table 12), or "36.5 percent of the minor injuries which occur in the galley happened during non-turbulence conditions in flight (Table 13). In a like manner, the location and severity of the injury can be related to the position in the aircraft where the injury took place. This is done in Tables 14 and 15. Table 14, for example, shows that 43.8 percent of all serious injuries to the torso/spinal column occurred while the flight attendant was in the seat, while Table 15 shows that 25 percent of all serious injuries which occurred while the flight attendant was in the seat acted upon the torso/spinal column. Tables 16 and 17 give information regarding percent of overall injury patterns and could be interpreted as saying that 21.5 percent of all injuries occur while the flight attendant is in the aisle (Table 16) and 15.9 percent of all injuries are bruises (Table 17). These data should be correlated with other factors such as the phase of flight, the activity, and the time spent at each position in the aircraft in order to fully understand the injury producing situation.

Many flight attendant injuries are not reported on the official accident/incident report forms and therefore do not become part of the FAA or NTSB accident/incident report file. However, flight attendant injuries are sometimes reported to other systems; such as, industrial injury reports made to the airlines involved and/or directly to the unions. A limited sample of some of these reports is contained in Appendix F. In addition many flight attendant injury reports that are submitted lack significant information. New guidelines on reporting requirements of factors to be investigated would appear to be warranted.

TABLE 12. Percentage of Minor and Serious Injuries by
Type of Incident and Position in Aircraft

Type of Incident	Reported Position														Percent of Total Injuries
	Not Given		Aisle		Galley		Seats		Standing		Percent of Incidents				
	M%	S%	M%	S%	M%	S%	M%	S%	M%	S%	M%	S%			
Turbulence	94.1	100.0	84.8	93.3	36.4	57.9	40.0	10.7	45.3	35.7	64.6	53.3	61.8		
In-Flight Non-Turbulence	5.9		4.5		52.3	31.6	28.0	3.6	31.7		22.1	17.4	21.0		
Non-Impact Ground			10.6	6.7	11.4	5.3	4.0	3.6	22.0	64.3	10.9	3.3	9.0		
Survivable Impact						5.3	28.0	82.1			2.5	26.1	8.2		
Total percent	100	100	100	100	100	100	100	100	100	100	100	100	100		
Injuries, N =	68	16	66	15	44	19	25	28	92	14	285	92	377		

TABLE 13. Percentage of Total Injuries Occurring at Given Locations During Different Types of Incidents

Location	Type of Incident												Total
	Turbulence		In-Flight		Ground		Survivable		Injury		Total		
	M %	S %	M %	S %	M %	S %	M %	S %	M %	S %			
Not Given	34.8	32.7	6.3						23.9	17.4	22.3		
Aisle	30.4	28.6	4.8		22.6	33.3			23.2	16.3	21.5		
Galley	8.7	22.4	36.5	37.5	16.1	33.3		4.2	15.4	20.7	16.7		
Seats	5.4	6.1	11.1	6.3	3.2	33.3	100.0	95.8	8.8	30.4	14.1		
Standing	20.7	10.2	41.3	56.3	58.1				28.8	15.2	25.5		
Total Percent	100	100	100	100	100	100	100	100	100	100	100		
Injuries, N =	184	49	63	16	31	3	7	24	285	92			
Total Injuries N =	233		79		34		31		377				

TABLE 14. Percentages of Total Injuries by Type and Severity at Given Locations in Aircraft

Position in Aircraft at Time of Injury	Location of Injury									
	Extremities		Torso/Spinal Column		Head		Not Given/General			
							Bruises/Cuts		Burns	
	M%	S%	M%	S%	M%	S%	M%	S%	M%	S%
Not Given	10.7	7.7	23.3	6.3	18.5		28.8		8.3	27.1 33.3
Aisle	25.0	11.5	6.7	12.5	29.6		33.9		66.7	16.3 23.1
Galley	39.3	15.4	16.7	18.8	37.0	60.0	20.0	100.0	25.0	2.3 12.8
Seat	14.3	53.8	23.3	43.8		40.0	3.4		20.0	9.3 10.3
Standing	10.7	11.5	30.0	18.8	14.8		13.6			45.0 20.5
Total	100	100	100	100	100	100	100	100	100	100

TABLE 15. Percent of Total Injuries

Location of Injury	Position in Aircraft at Time of Injury									
	Not Given		Aisle		Galley		Seats		Standing	
	M%	S%	M%	S%	M%	S%	M%	S%	M%	S%
Extremities	4.4	12.5	10.6	20.0	25.0	21.1	16.0	50.0	3.7	21.4
Torso/Spinal Column	10.3	6.3	3.0	13.3	11.4	15.8	28.0	25.0	11.0	21.4
Head	7.4		12.1		22.7	15.8		7.1	4.9	
Not Given or General										
Bruises/Cuts	25.0		30.3		27.3	5.3	8.0		9.8	
Burns	1.5		12.1	6.7	6.8	15.8		3.6		
Unknown	51.5	81.3	31.8	60.0	6.8	26.3	48.0	14.3	70.7	57.1
Total	100	100	100	100	100	100	100	100	100	100

TABLE 16. Percent of All Injuries at Position in Aircraft

Position in Aircraft at Time of Injury	Percent of Injuries		
	Minor	Serious	All
Not Given	23.9	17.4	22.3
Aisle	23.2	16.3	21.5
Galley	15.4	20.7	16.7
Seat	8.8	30.4	14.1
Standing	28.8	15.2	25.5

TABLE 17. Percent of All Injuries By Location of Injury

Location of Injury	Percent of Injuries		
	Minor	Serious	All
Extremities	9.8	28.3	14.3
Torso/Spinal Column	10.5	17.4	12.2
Head	9.5	5.4	8.5
Not Given General			
Bruises	20.7	1.1	15.9
Burns	4.2	5.4	4.7
Unknown	45.3	42.4	44.6

While the information in this study is not statistically definitive it does show the need for optimum seat/restraint systems for flight attendants. Recent changes in the regulatory requirements for flight attendant seats should provide improvements in this area. As these new installations become operational, follow-on studies should be made to assess their effectiveness.

It is more difficult to reduce injuries when flight attendants are unable to use a restraint system. Many of these injuries will continue to occur because of the unanticipated nature of the environment created by this type of occurrence. However, flight attendant injuries during turbulence

could possibly be reduced by increasing the awareness of the problem during crewmember training; continuing emphasis on crew coordination; and publishing reminders in industry journals.

In order to continue to reduce the injury rate of flight attendants there is a need for the continued collecting, storing, analyzing, and reporting of the nature and location of these injuries in order to identify trends and problem areas so that solutions can be developed.

Conclusion

The information in the CAMI Cabin Safety Data Bank, based on official FAA and NTSB accident/incident reports for the years 1971-1976, indicates most flight attendant injuries occurred during turbulence, usually while the flight attendant was up, in the galley, or in the aisle. These injuries were usually minor cuts and bruises. The serious in-flight injuries were generally to the limbs and occurred as a result of severe turbulence. The highest percentage of serious injuries occurred during survivable impact while the flight attendants were in their seats and the highest percentage of these injuries was to the limbs. Unfortunately the location and nature of flight attendant injuries were not given for a large percentage of incidents.

APPENDIX A

FLIGHT ATTENDANT INJURIES IN TURBULENCE 1971-1976

DESCRIPTIONS

Date	File No.	No. Injuries	Summary
01/03/71	1-0028	2M	The seatbelt sign was on. The files gave no indication of the extent of injuries to the two F/A and one pax injured in this incident.
01/21/71	7-0031	2M	Meal service was in progress and the seatbelt sign was off when turbulence was encountered. F/As received minor injuries when they were thrown against carts during this turbulence. Two pax were also injured.
02/07/71	1-0027	2*	The seatbelt sign was on. Pax and F/As were advised to stay seated because turbulence was expected. The F/As got to their seats but were unable to fasten their restraint systems before the turbulence hit. No further description of the injuries is given in the files.
02/07/71	1-0046	1S 1M	The seatbelt sign was on and the captain had turned off the no smoking sign so the F/As could serve. The F/A who was seriously injured was in the buffet. A doctor was noted to have been on board, but no indication is given of the nature of injuries. One pax was also injured.
02/23/71	7-0032	1M	The seatbelt sign was off; however, the cabin occupants had been orally briefed. A F/A and one pax sustained minor injuries.
03/25/71	7-0034	3M	The F/As were taken to a hospital for examination and released. Three pax were also examined and released.
03/29/71	1-0037	1S	The seatbelt sign was on. F/As were picking up service. No record is given of the extent of the injuries.

*When extent of injury is unknown, it is classified as minor.

05/09/71	7-0036	1M	Flying through rain showers with the seatbelt sign on, the two F/As in the aft portion of the cabin did not have time to take their seats. One F/A reported a sore back, but after being x-rayed was allowed to continue the trip. One pax also received a minor injury.
06/06/71	7-0037	1M	The seatbelt sign was on. The F/A was jolted against the bulkhead as she proceeded to the blueroom and sustained a back injury.
06/06/71	7-0038	2M	Turbulence was encountered when the F/As were picking up meal service. Two F/As were injured; one sustained a back strain and the other a cut leg. A 6-month-old child was also shaken up.
06/20/71	1-0016	1M	The seatbelt sign was off. The injured pax (2S and 8M) did not have their seatbelts fastened. No description of F/A injuries is given.
07/26/71	1-0034	1S	The seatbelt sign was off but was turned on immediately when turbulence was encountered. A F/A broke an ankle. Two doctors were on board.
08/05/71	1-0023	1S	The seatbelt sign was turned on but heavy turbulence was encountered before the F/As reached their seats. One F/A fractured a hip bone.
09/17/71	7-0040	2M	CAT. Five pax also received minor injuries.*
09/18/71	7-0041	1M	A F/A sitting in a F/A seat that collapsed during turbulence suffered a bruised coccyx and lower back.
10/27/71	7-0042	1M	The seatbelt sign was on. A F/A suffered bruises on the hip and both knees and hands. No indication is given of how the injuries were sustained.
11/18/71	7-0043	1M	A F/A in the galley was removing liquor bottles from a drawer when turbulence was encountered. A liquor drawer fell on top

*Nature of F/A injuries not in CAMI files

of the F/A and resulted in back pain.

11/28/71	7-0044	2M	The seatbelt sign was on. F/As were thrown to the ceiling and knocked unconscious. Both were in the galley area.
12/16/71	7-0046	3M 1S	The seatbelt sign was on. Turbulence was encountered--one sharp jolt. Four F/A injuries were sustained: (1) sprained back; (2) torn ligaments; (3) sprained knee; and (4) fractured ankle and broken toe.
12/23/71	1-0045	1S 1M	A F/A was injured during turbulence. No warning was given and the seatbelt sign was not on. F/As in the aft galley were treated by a doctor (pax) in flight.
01/04/72	1-0006	4	The seatbelt sign was on. Two doctors were on board. The nature of the injuries was not clear. The doctors stated that first aid equipment that was on board was insufficient. Thirty-three pax were also injured.*
01/12/72	7-0047	1M	The seatbelt sign was on. A F/A sustained minor injuries and was taken to the hospital and released the same day. Two pax also received minor injuries.
02/28/72	7-0048	1M	The seatbelt sign was on. The aircraft encountered CAT. A F/A suffered a head injury and was dazed. One pax also received minor injuries.
03/02/72	7-0049	6M	The seatbelt sign was on. The aircraft encountered CAT. Six F/As received a combination of bruises, contusions, and lacerations.*
03/28/72	1-0012	1	No information is available as to whether the seatbelt sign was on or off. The only information given about injuries is about an 8-year-old child who was severely injured and found unconscious in the lavatory. One F/A and two pax were injured in this accident/incident.

*Nature or extent of F/A injuries not in CAMI files.

04/12/72	1-0007	6M	The two uninjured F/As (total of eight aboard) were strapped in pax seats. The aircraft encountered CAT. The seatbelt sign had been turned off, but pax were advised to keep their belts fastened. Of the injured pax (2S, 7M), a small boy had a fractured left arm just above the elbow and a small girl sustained a dislocated shoulder. Other injuries were abrasions and lacerations.
05/21/71	7-0051	1M	CAT - F/A in galley area sustained a cut on the head.
06/21/72	1-0026	1S	The seatbelt sign was on and the captain had told the F/As to stay seated. A F/A with about 2 1/2 months' seniority got up to help a pax and was seriously injured when the severe turbulence hit. No description of the injuries is given.
06/28/72	1-0028	1S	The seatbelt sign was on but had not been given four bells (which on this carrier indicates severe turbulence, F/As should fasten themselves into their seats immediately). One F/A sustained a fractured vertebra.
06/28/72	7-0054	1M	The seatbelt sign was on. CAT was encountered. One F/A bruised an upper arm. The one pax who was also injured was not wearing a seatbelt and sustained a cut on the head.
07/14/72	7-0055	1M	The seatbelt sign was on. A F/A was thrown in the air and came down on a cart. F/A twisted her back and had severe pain in the left leg, could not straighten the right leg (which bent under her), stayed in the hospital for 48 hours, and was diagnosed as having a pinched nerve in her back.
07/18/72	1-0027	1S	F/A injured seriously during turbulence.
07/22/72	1-0032	1M	The seatbelt sign was on, but not long enough. A full coffee pot fell on a F/A. A pax also sustained minor injuries (caught in lavatory). A nurse on board helped to treat injuries.

08/13/72	7-0057	3M	The seatbelt sign was on but two of the F/As were not in their seats. One sustained a severe back injury, and both had minor head injuries.*
08/20/72	7-0058	2M	The seatbelt sign was off. The aircraft encountered CAT. One F/A sustained a bruised arm/back and one F/A had minor head injuries and a mild concussion.
09/17/72	7-0059	1M	The seatbelt sign was on. The F/A was knocked down, complained of a lower back pain, and was in the hospital 37 hours for observation.
09/17/72	7-0061	1M	The F/A was properly seated, but twisted sideways to avoid flying objects (soda cans, glasses) from properly secured liquor cart. F/A sustained a minor back strain.
09/17/72	7-0062	3M	The seatbelt sign was on. The F/As were picking up in the cabin. Three F/As were injured: one refused treatment and the other two were taken to the hospital where they were treated for contusions.
09/30/72	1-0021	1S 2M	The seatbelt sign was on. Two seats were broken. F/As received one serious and two minor injuries and pax received two serious and 14 minor injuries. No information is given about the nature of the injuries.
10/13/72	7-0063	5M	The seatbelt sign was on and meal service was in progress. Debris was scattered all over the cabin. Injuries (F/A 5M; Pax 6M) included burns, bruises, scrapes.
10/24/72	1-0036	2M	The seatbelt sign was on and the captain made a second announcement because the F/As could not get the pax to stay seated. F/As received 2M injuries and pax 1S and 2M injuries. No further description of the injuries is given.*

*The nature or extent of the other F/A injuries not in CAMI files.

12/04/72	1-0041	1	The seatbelt sign was on. The F/A was returning to a seat following service. No description is given of the injuries.
12/29/72	7-0064	1M	The seatbelt sign was on. The aircraft encountered CAT. The F/A started toward a seat but turbulence hit and the F/A sustained a blow to the head. F/A was examined at a hospital and released.
01/01/73	7-0065	2M	The seatbelt sign was on and the cockpit called back but F/As did not get back to their seats in time. Both injured F/As were securing the back galley; one F/A had four teeth knocked out and the other was cut on the back and shoulders.
01/22/73	7-0066	1M	The aircraft encountered a short period of turbulence. A F/A received minor burns when hot coffee was splashed on face and hands.
01/29/73	7-0067	1M	The aircraft encountered CAT. One pax and one F/A sustained minor injuries. They were examined by a doctor and released.
02/19/73	7-0068	2M	The captain instructed the crew and pax to fasten their seatbelts because of turbulence. Two F/As did not have their seatbelts buckled and were injured. They were given one week off for rest--sustained bruises to their heads.
02/26/73	7-0069	1M	The seatbelt sign was on. The injured F/A hit the oven and galley and sustained hip bruises. A doctor met the flight; the F/A was x-rayed and off duty for three days.
02/27/73	7-0070	3M	The aircraft encountered CAT. Three F/As who were up were thrown to the floor and sustained minor injuries. Two pax also sustained minor injuries.
02/28/73	1-0002	1S	The seatbelt sign was on. While the aircraft was descending through 29,000 feet, the injured F/A was thrown about while trying to get into jumpseat. F/A sustained a fractured coccyx.

03/11/73	7-0071	1M	F/A was fitted for back brace following injury. Three pax also received minor injuries.
03/17/73	1-0007	2S	The seatbelt sign was on. One F/A reported she could not see the sign - "Crew called immediately when turbulence hit by then damage done." No mention is made of the nature of the injuries.
04/01/73	1-0004	1S	The aircraft encountered CAT. The seatbelt sign was on and sufficient time was allowed for F/As to reach their seats. One F/A broke an ankle.
05/06/73	7-0073	1M	The aircraft encountered CAT. A F/A carrying a full food tray fell in the aisle seat occupied by a pax and sustained slight injuries and bruises. One pax also received minor injuries. No medical treatment was given.
05/11/73	7-0074	3M	The seatbelt sign was on. F/A were checking pax tossed about and sustained bruises. F/A was checked at the hospital. An elderly pax was removed from the aircraft because of nervous state (sources not specified).
05/11/73	7-0076	1M	A F/A got up from seat to ask pax to be seated. On the way back the F/A hurt ribs and was taken to the hospital for observation.
05/24/73	7-0078	2M	The seatbelt sign was on. One F/A sustained an injured ankle; one F/A hit head on overhead light. Company elected to make an unscheduled stop and have F/As examined.
06/12/73	7-0079	1M	The seatbelt sign was on. The F/A was in the process of sitting on a jumpseat when severe turbulence hit. One pax also sustained a minor injury in this incident.
06/19/73	7-0080	1M	The seatbelt sign was on; however, the captain had allowed F/A to continue serving. One F/A received minor injuries.

06/19/73	1-0016	1S 1M	The seatbelt sign was on. The second officer asked the pax to keep their seatbelts fastened--that light turbulence was expected. Two F/As in the aft galley were injured when the aircraft encountered a "down draft" and one F/A had to be removed from the aircraft by stretcher. One pax also sustained minor injuries. No description is given of the injuries.
07/24/73	1-0013	1S 1M	The seatbelt sign was on. Both of the injured F/As were in the galley at the time of the accident/incident. One F/A received a cut from landing on the edge of a cart.
08/11/73	7-0082	3M	The seatbelt sign was on. F/A bruised a shoulder and was thrown to the floor and "shaken up." F/As were able to continue duties after incident.
09/10/73	7-0083	1M	F/A was found unconscious and one pax (minor injuries) was found on the floor stunned. Both were taken to the hospital.
09/22/73	7-0085	1S	During extreme turbulence a F/A received spinal injuries and was taken to the hospital. One pax received a bump on the head while still fastened in a seat.
11/18/73	7-0086	1M	"Severe down draft; two passengers and one flight attendant taken to hospital and released."
11/27/73	7-0087	1M	The seatbelt sign was on. A F/A while checking pax seatbelts lost balance and struck head on overhead rack. F/A was examined by "medical person" and a neck brace was applied.
12/21/73	1-0031	1S	During unforecasted turbulence a F/A was injured.
01/13/74	1-0005	1S	During completion of service, a F/A hit the overhead rack when turbulence was encountered--was knocked unconscious.

02/04/74	7-0088	1M	The seatbelt sign was on. A F/A left her seat to recover a small child walking in the aisle. Turbulence upset her balance, causing her to sustain a severe ankle sprain.
02/15/74	1-0003	1S	During CAT a F/A in the rear galley was thrown against the ceiling and fell to the floor.
02/21/74	1-0015	1S	The seatbelt sign was off. A F/A fell in the galley and sustained a broken leg.
03/03/74	7-0321	1M	Turbulence was encountered before the F/A could get the seatbelt fastened. She was thrown on the floor and couldn't move her arm or neck and had difficulty breathing. She was taken by ambulance to the hospital where it was diagnosed that she had suffered contusions of the left upper back and neck--there were no signs of broken bones.
03/09/74	7-0323	1M	The F/A and one pax who were injured in this accident/incident sustained cuts and bruises when the aircraft encountered moderate turbulence.
03/14/74	7-0324	2M	Two F/As did not have seatbelts fastened and were thrown to the floor. They sustained minor injuries.
04/02/74	1-0007	1S	The F/A was injured when the aircraft encountered turbulence.
04/28/74	7-0325	1S 1M	The seatbelt sign was on. The injured F/As were in the aft galley. One F/A suffered a concussion, and the other broke a bone of her right foot. They were taken to a local hospital and released the following day.
05/12/74	7-0327	1M	A F/A was injured while returning to a seat. A pax, seated with the seatbelt fastened, also received minor injuries. No description is given of the injuries.
07/03/74	1-0023	2S	The two were injured while checking seatbelts when the aircraft flew into an area of known turbulence.

07/27/74	1-0022	1S	The seatbelt sign was on during a thunderstorm. Two F/As were seated on the rear left jumpseat with shoulder harnesses fastened. The seat folded up and one F/A was pinned to the aircraft wall. The other F/A seatbelt became unfastened and she was thrown to the ceiling and her legs struck a cart. No further description is given of the injuries. (Only one of the F/As was injured.)
08/03/74	7-0333	4M	All injuries were minor and were caused by loose silverware and trays. (15 pax were also injured.)
09/01/74	1-0010	1S	The seatbelt sign was on and the captain had made an announcement before the aircraft entered turbulence. The injured F/A received severe whiplash injury while trying to hold a cart down.
09/21/74	1-0039	1S	The injured F/A left her seat to start her duties; she fell and sustained a fracture at the ankle.
12/01/74	1-0036	1S	F/A underestimated copilot's warning, delayed returning to a seat, and was thrown against the ceiling.
12/05/74	1-0043	1S	Crew gave both visual and oral warning (oral warning was in Spanish and in English). One pax was seriously injured as he walked from the aft lavatory to his seat; he was thrown to the floor and sustained a spinal fracture. No information is given on the F/A injury.
12/21/74	7-0648	1S	F/A came forward to adjust an air vent, struck her head and sustained a concussion.
01/10/75	7-0799	1M	The seatbelt sign was on. A F/A suffered minor injuries and was taken to the airport clinic where she was examined and released. One pax also sustained minor injuries.
01/20/75	7-0800	1M	A F/A was injured when she left her seat during turbulence to prepare for meal service. An M.D. on board examined her. On landing she was sent to the hospital

for further examination. Her injuries were diagnosed as minor bruises.

02/13/75	7-0801	1M	The aircraft encountered turbulence at 19,000 feet. The injured F/A was thrown against the aft galley door and hit her head on the service counter. The food cart was thrown against her. When the aircraft landed, she was taken to a hospital where she was x-rayed and her injuries were diagnosed as minor. (Additional information is given in the CAMI files.)
02/24/75	7-0802	1M	CAT--The F/A standing in the rear of the aircraft sustained minor back injuries. (Additional information is given in the CAMI files.)
02/24/75	7-0803	1S	The seatbelt sign was on and the F/A fell while serving pax. She fell on her right arm and broke two bones.
03/13/75	1-0043	1S	CAT--Two overhead panels of the rear galley unlatched and fell. F/A was seriously injured (head injury).
03/21/75	1-0004	1S	F/A was hurt during turbulence. The seatbelt sign was off.
05/24/75	7-0804	1M	CAT--The seatbelt sign was on. F/A was walking to the jumpseat when there was a severe jolt. She cracked her nose, sustained bruises to her thigh, and, on landing, was taken to the hospital where she received treatment (including two stitches) and was released.
06/04/75	7-0805	5M	F/A injuries were: (1) wrenched back, (2) pain in neck and back of left side of chest, (3) dizzy, pain over back and tenderness in coccyx, (4) pain over left scapula, (5) pain in right loin, tenderness in 11 and 12 ribs, right side. (Additional information is given in the CAMI files.) Seven pax also sustained minor injuries in this accident/incident.

06/20/75	1-0011	1S	The seatbelt sign was on. A F/A lost balance and fell against pax seat.
06/24/75	7-0806	1M	The seatbelt sign was on. A F/A received a bruise on the back.
07/13/75	7-0807	1S	As the aircraft descended into Detroit with the seatbelt sign on, a F/A picking up trays was thrown across a seat row and sustained severe back injury. F/A was off schedule for 10 days.
07/18/75	7-0803	2M	The seatbelt sign was on. A F/A sustained minor injuries while securing the cabin. Three pax also received minor injuries in this accident/incident. (Additional information is given in the CAMI files.)
08/08/75	1-0015	1	CAT--The seatbelt sign was off when the turbulence was encountered. A F/A was thrown from the seat which folded, and struck a seat.*
08/18/75	7-0811	1M	The seatbelt sign was on. During the turbulence, a F/A was thrown to the floor of the galley. She was momentarily unconscious. However, later in the flight she performed some duties. F/A was examined at a hospital and did not require hospitalization.
09/08/75	7-0813	2M	The seatbelt sign was on. The F/A were ambulatory upon landing. They were examined at a hospital and their injuries were classified as minor. Five pax also sustained minor injuries.
11/24/75	7-0815	1M	CAT--F/A sustained minor injuries.
12/22/75	1-0045	1S	A F/A was injured during CAT.
01/31/76	7-0973	2M	Turbulence associated with proximity of mountains was encountered and two F/As were thrown around and received minor injuries. One pax also sustained minor injuries.

*Nature or extent of F/A injury not in CAMI files.

01/24/76	7-0974	3M	During turbulence greater than expected, F/As were thrown around and received minor injuries. (Additional information is given in the CAMI files.)
02/22/76	1-0004	1S	The aircraft encountered thunderstorm activity. The seatbelt sign was on; however, the F/A who was injured was not seated.
03/03/76	1-0007	2M	The F/A in the rear cabin sustained injury to an arm. The seatbelt sign was on, but meals were being served at the captain's discretion. Five pax also received injuries (1S, 4M).
03/20/76	7-0978	3M	During turbulence, F/As were thrown around and sustained injuries: possible broken nose and two F/As sustained possible back sprains. One pax also sustained minor injuries.
03/30/76	7-0980	2M	Light to moderate turbulence was encountered during descent. Both F/As in the galley area fell. One sustained a bruised shoulder and sprained neck; the other sustained a concussion. (Additional information is given in the CAMI files.)
03/31/76	7-0981	1M	Light turbulence was encountered. One of the F/As was returning trays to the galley when she hit her knee on the side of a seat. The indentation on her knee was severe enough that on initial examination at a hospital it was thought she had a broken knee. Additional information is given in the CAMI files.
04/18/76	7-0982	1M	The flight encountered unforecasted CAT. One F/A received minor injuries.
04/24/76	7-0983	2M	The seatbelt sign was on, but two F/As sustained minor injuries.
05/12/76	7-0984	1M	The seatbelt sign was off. A F/A sustained minor injuries. One pax also received minor injuries

06/12/76	1-0019	1S 1M	F/As were advised to take their seats; this was followed by an announcement to all cabin occupants to stay seated. F/A bent over to secure suitcase and sustained minor injuries. The second injured F/A sustained a back injury (fracture of the thoracic vertebra). He was securing the galley when injured.
06/17/76	7-0987	1M	The aircraft encountered turbulence during descent for landing. One F/A received minor injuries.
06/22/76	7-0989	3M	The aircraft encountered turbulence during descent for landing. F/As sustained the following minor injuries: minor abrasion and burn; slight cut on finger; and back sprain.
10/02/76	7-0997	2M	Aircraft encountered turbulence during climb and F/As were injured. The FAA report states: "The two flight attendants that were injured several appear to have been injured by serving cart." (sic) Four pax also received minor injuries.
11/25/76	7-0998	2M	The aircraft encountered CAT and two F/As were injured.
11/27/76	7-0999	1M	The seatbelt and the no smoking signs were both on. The F/A sustained a knee and hip injury and was unable to bend the right leg. (Further information is given in CAMI files.) Five pax received minor injuries.
12/31/76	7-1001	5M	Aircraft penetrated a front and when the captain thought they were clear he allowed F/A to resume service. They again encountered turbulence and five F/As sustained minor injuries.

APPENDIX B

FLIGHT ATTENDANT INJURIES IN IN-FLIGHT INCIDENTS OTHER THAN TURBULENCE 1971-1976

DESCRIPTIONS

Date	File No.	Injuries	Summary
05/25/71	7-0646	1M	F/A slipped and struck knee cap. No further information in CAMI files.
06/29/71	7-0177	1M	F/A had fallen and was found unconscious in galley. No further information in original FAA report.
10/18/71	7-0179	1M	F/A in personnel elevator coming up from lower galley when shoe caught between floor and bulkhead, bending shoe and toes down. Two toes on right foot injured.
11/26/71	7-0238	1M	F/A accidentally lifted activating handle on DC-10 and deployed slide. This dropped her between door and communication console. She was slightly injured.
02/18/72	7-0229	2M	When autopilot disengaged, aircraft nose pitched up. This resulted in minor injuries. Nine pax were also injured. No further information is in the CAMI files about the nature of injuries.
03/25/72	7-0181	2M	When aircraft rotated the left rear galley doors came open and permitted tray carriers to slide rearward. Food trays struck F/As causing minor leg injuries. Statements of F/As indicate door was closed and locked for takeoff. No further information in CAMI files about nature of injuries.
04/26/72	7-0183	2M	Collision avoidance maneuver. F/A seated on aft jumpseat was thrown up and off seat. Treated for possible back injury and bruises. F/A securing cabin thrown to side. Hit head. Treated for bruise on head.

NOTE: Unless otherwise noted there is no additional information in the CAMI files about the nature or extent of the injuries.

05/28/72	7-0185	1M	Storage drawer broke in personnel lift. Particles and fiberboard from drawer and glass from ceiling light were broken and sprinkled over F/A. Some landed in eye. Doctor on board recommended medical attention on landing. Off schedule for three days.
07/18/72	1-0027	5 (1S)	Severe oscillation of aircraft. No information in CAMI files about nature of injuries. Mention of assistance following accident.
07/23/72	7-0187	1M	While she was attempting to remove pre-iced glass from tray carrier, a flight attendant cut the thumb on her right hand. The cut required three stitches.
09/02/72	7-0125	1M	An unruly passenger grabbed a flight attendant by the throat just prior to landing. The flight attendant received a bruise on the neck and after landing was treated in hospital and released. The police met the flight and said the passenger appeared to be drunk.
09/28/72	7-0128	1M	A passenger tried to open the cockpit door and a flight attendant attempted to restrain the individual. During the ensuing struggle the flight attendant was struck on the face and body. Four passengers restrained the unruly passenger and the captain declared an emergency. The flight was met by police. No further information in CAMI files.
11/20/72	7-0231	2M	Galley coffeemaker exploded and top of hot water tank blew out. Flight destined for London landed at JFK. Doctor assisted other F/As in giving first aid. (1 F/A) Laceration on forehead 6-inch-long cut requiring 15 stitches, hematoma left arm, sore rib cage from being hit by flying debris. (2 F/A) Blow to elbow, small laceration of cheek, treated for shock.

04/17/73	7-0233	2M	During evasive maneuvers two F/As sustained minor back strain.
05/12/73	7-0190	1M	During meal service, F/A cut back of right hand on metal strip protruding from galley service entre cart. One-half-inch cut required six stitches. No additional information.
08/10/73	N67NA	1S	F/A sustained serious injury when food service lift was inadvertently operated while she was attempting to dislodge a jammed food cart in the lift. No doctor on board. Given first aid by other F/A. Taken to hospital and treated for broken nose, abrasions, and contusions. Underwent immediate plastic surgery and hospitalized for nine days.
08/16/73	1-0022	1S	Flight control system problem caused F/A to be seriously injured.
08/22/73	1-0025	1S	Unwanted sudden yaw damper induced rudder input. This unusual flight problem resulted in injury to F/A.
08/28/73	1-0042	1S	Cause of injuries was violently porpoising autopilot. Twenty-one pax were also seriously injured and one was fatally injured.
09/10/73	7-0162	1M	A passenger who had consumed several drinks in the first class "open bar" struck a flight attendant. He was subdued by fellow passengers. No further information in CAMI files.
10/03/73	7-0196	1M	F/A slipped on beverage spilled in cabin. Taken to hospital and released.
10/03/73	7-0197	1M	In the process of stowing equipment in the lower-lobe galley a food cart rolled down the galley and struck a F/A in the back. F/A sustained back injury, was taken to the hospital and released.
11/03/73	1-0043	4M	During rapid decompression two flight attendants in lower lobe galley lost consciousness, one flight attendant sustained a severe burn to the hand when she attempted to handle a chemical generator oxygen cylinder. There is no information in CAMI files about the nature or cause of the other injury.

12/15/73	7-0201	1M	F/A sat down on corner of an open buffet door and cut herself in the paravaginal area. Flight returned to Houston, F/A taken to hospital. Five stitches taken to close wound.
02/04/74	7-0204	1M	F/A dropped cup drawer full of ice on her foot. Taken to hospital and released. Nature of injury, minor bruise to right foot.
02/16/74	1-0027	1S	Galley coffeemaker exploded in flight, burning F/A.
02/24/74	7-0438	1M	Passenger struck flight attendant. There is no further information in CAMI files about the nature or severity of the injury.
06/29/74	7-0495	1M	Emergency exit light over left rear pax door fell out and struck F/A seated at that location. F/A sustained head injury. Flight was diverted and F/A kept in hospital overnight for observation.
07/13/74	7-0496	1M	F/A had pain while walking, and bruises and possible blood clots, but no cuts. She was relieved of duties. Ambulance met flight and she was taken to hospital. No indication of cause of injury.
08/30/74	7-0498	1M	F/A sustained minor facial burns when hot water spewed from top of coffee canister. After aircraft landing, she was treated at a local hospital and released.
08/31/74	7-0551	1S	F/A sustained second degree burns when sprayed in eye and on side of face with hot coffee. Released from duty. Doctor met flight.
09/27/74	7-0552	1S	F/A twisted her ankle, slipped and fell in galley striking some part of the galley equipment as she went down. F/A was removed from aircraft by stretcher, taken to clinic. Returned to domicile but still not returned to duty and still under care of doctor five days later. No further information.

11/07/74	7-0549	1M	F/A came in contact with buffet door as she was stooping down and injured herself in pelvic area. Was taken to hospital after scheduled landing and released.
11/22/74	7-0550	1M	Food cart being placed in lift fell on F/A's leg. Doctor on board gave treatment for minor bruises. After aircraft landed she was taken to hospital for x-ray and released.
12/28/74	1-0044	1S	Uncontrolled altitude deviation. Seatbelt sign not on and injured were not wearing seatbelts. Injured F/A was in lavatory. Five pax also sustained minor injuries.
01/22/75	7-0947	1M	Aircraft yaw damper was faulty and caused yaw to left. The F/A in the forward galley was injured when she hit head on "galley/cabin structure."
04/26/75	1-0010	1S	"Fairchild Food cart RLSD rolled aft, hit F/A facing the left lift." Not determined how food cart released.
07/21/75	7-0944	1M	F/A tripped and fell in galley during flight through smooth air. She was not sure why she fell. She thinks she may have fallen over a case of coke. Injury diagnosed as back bruise.
10/06/75	7-0946	1S	F/A dropped coffee pot and scalded herself. She was treated for first and second degree burns.
11/14/75	7-0837	1M	F/A hit on ankle when F/A seat fell off wall. Additional information in CAMI files.
11/26/75	1-0024	3S 7M	Meals and beverages were being served and F/As and serving carts were thrown to ceiling. The injuries to F/As consisted of miscellaneous abrasions, contusions, lacerations and sprains. Two of the three serious injuries consisted of fractured bones (compression fracture of vertebrae and fractured humerus). The third was classified as serious because of the length of time the patient was hospitalized with a knee laceration. Fourteen pax were also injured (three seriously).

12/14/75	7-0903	1M	F/A tripped on metal strip in galley and fell on hand. She went to dispensary and was told she had a sprain. She continued to work flight but was removed at next stop because her hand was swollen and painful.
01/08/76	7-1116	1M	F/A requested a passenger to not smoke, the passenger struck her on the arm. There is no further information in CAMI files about the nature or extent of the injury.
02/04/76	7-1152	1M	F/A left galley with a tray containing several drinks and a metal pitcher of hot water. She spilled pitcher of hot water on right forearm while serving drinks and sustained second degree burns.
02/19/76	7-1164	1M	Pax became violent and struck three F/As. Pax had background of mental illness. Additional information in CAMI files.
07/20/76	7-1118	1M	Passenger struck a flight attendant, two cockpit crewmembers and five passengers. There is no further information in CAMI files about nature or extent of injuries.
08/10/76	7-1157	1M	F/A cut right thumb while closing a buffet tray door. Examined by nurse upon landing and released.
08/18/76	7-1158	1M	F/A cut finger badly on jumpseat of DC-9. Additional information in CAMI files.
09/01/76	7-1159	1	F/A spilled hot coffee on arm from cart during service. She was off flight status for three days.
09/04/76	7-1160	1	Was struck on knee by two cans of soda pop which had been incorrectly stored. Was treated for bone chip in right knee.
11/17/76	1-0027	1S	F/A seriously injured during evasive maneuvers to prevent collision with other aircraft.
11/28/76	7-1163	1	F/A cut one inch of finger off in jumpseat of DC-9. Additional information in CAMI files.

APPENDIX C

FLIGHT ATTENDANT INJURIES IN NON-IMPACT GROUND ACCIDENTS 1971-1976

DESCRIPTIONS

Date	File No.	Injuries	Summary
04/19/71	7-0175	1S	Coffeepot came out on takeoff and spilled on F/A who as a result suffered second degree burns. The coffeepot lock was in good condition but had not been used.
05/05/71	7-0176	1M	During taxi, the captain applied the brakes with enough force to throw the F/A over a pax seat and into the galley. F/A sustained injuries, but the nature of the injuries was not given.
05/15/71	1-0011	2M	According to the CAMI data sheet, "six people were hurt when they jumped from the wing to the ground" during an evacuation. No further information is given in the CAMI files about the nature or cause of the F/A injuries or the five serious and one minor pax injuries sustained in this incident.
05/18/71	1-0012	1S	F/A fell and injured an arm during the takeoff roll. F/A was in the galley, and the report states: "Neither of us heard a call bell signal to inform us of takeoff." The report further states: "As I stepped on the floor by the buffet I fell sliding all the way to the coat closet."
06/02/71	7-0243	1M	Aircraft blew a tire and during the ensuing unforewarned emergency evacuation a F/A and six pax suffered minor injuries. The report indicates the injuries occurred during the evacuation. (There is no further information in the CAMI files.)
06/29/71	1-0048	4M	During a bomb threat evacuation, the slide at the second door on the right side of the aircraft deployed at an angle. One pax was seriously injured from falling out of this slide. The cause and nature of the four minor F/A and 25 minor pax injuries were not determined.

03/25/72	7-0181	2M	When the aircraft rotated, the left rear galley doors came open and permitted the tray carriers to slide rearward. Food trays struck F/As, causing minor leg injuries. Statements of F/As indicate that the doors were closed and locked for takeoff. (No further information is given in the CAMI files about the nature of the injuries.)
06/10/72	1-0049	1S 1M	The aircraft had taxied to the gate to deplane pax. All but six of the pax had deplaned when one of the pax complained of being nauseated, and a F/A reached for a portable walk-around oxygen bottle. The bottle exploded in her hands. She had two pieces of shrapnel in her jaw, a singed eyebrow, and second degree burns on her upper torso. Other crewmembers had hair singed. The captain also received minor injuries. (Additional information is available in CAMI files.)
07/02/72	7-0270	3M	During an evacuation as a result of a hijacking, three F/As sustained minor injuries. (No further information is given in the CAMI files about the nature of these injuries.)
08/14/72	1-0033	1M	During taxi the "wind picked the FH-227 up and turned it completely around." The injured F/A was standing in the aisle while the pax had their seatbelts fastened. (There is further information in the CAMI files.)
01/17/73	7-0205	2M	While an aircraft was taxiing, it lost nose wheel steering. When emergency brakes were applied to stop, two F/As were thrown because of the sudden stop. F/As were taken to a hospital where they were x-rayed and released.
04/17/73	7-0233	2M	Flight encountered wake turbulence. Two F/As received minor back strain. They were not hospitalized.

01/16/74	7-0203	1M	A F/A was securing the galley as the aircraft taxied for takeoff. An aft tray carrier door fell, hitting her ankle, and the protruding metal plunger from the door lock made a deep gash in her leg.
11/26/74	1-0041	1M	During taxi the cove lights started to emit smoke and sparks. When the F/A notified the flight deck crew their reply was "O.K. Disembark." The F/A initiated an evacuation. One F/A sustained bruises on the feet and hands, probably either from landing at the bottom of the chute or from being blown around by exhaust wind from the still-running jet engine. No other crewmembers were injured; however, 46 of the 141 pax sustained minor injuries and three were seriously injured.
12/27/74	7-0506	4M	During an unforwarned evacuation, four F/As received minor injuries and bruises. Two had ankle injuries and two had hip injuries. (No further information is given in the CAMI files about the nature or causes of these injuries.)
01/18/75	7-0793	1M	During an unforwarned emergency evacuation a F/A received a minor injury. (No further information is given in the CAMI files about the nature or cause of this injury.)
08/24/75	7-0899	1M	A F/A was stowing commissary items in the galley preparatory to a flight from Albuquerque to Los Angeles. A swizzle stick that was protruding over the edge of its container was inadvertently struck, flipping it out of the container and striking the F/A in the eye. On arrival at Los Angeles, a paramedic suggested that she be examined by a doctor. She was examined by a doctor and removed from flight status for four days.

11/12/75	1-0022	1M	The aircraft crashed while attempting a landing. An off duty F/A with the involved company sustained an arm injury while opening an overwing exit. (Since she performed the duties of a F/A and was in uniform, her injury is included in this report.) There is no further discussion of the nature or cause of this injury in the NTSB Human Factors Report; however, there is a comment about one of the regularly assigned F/As having a previously injured arm. Of 139 occupants on board, six pax received minor injuries and one pax received a serious injury during the evacuation.
01/13/76	7-0961	1M	During a forewarned emergency evacuation because of a bomb threat, a F/A sprained her ankle while going down an emergency escape chute. The only other known injury among the 85 occupants was a minor back injury to a pax.
04/28/76	7-1088	2M	While taxiing the aircraft, the captain found he had no brakes or steering. He pulled the emergency brakes and stopped the aircraft. A F/A was thrown forward and received a badly bruised arm. Taxiing back to the ramp, the captain applied the emergency brakes at the taxiway turnoff at which time a second F/A was thrown and received a facial laceration.
08/05/76	7-1156	1M	"A normal landing was made. When moderate braking was applied on landing roll, a tray carrier door came open in aft galley and struck F/A on the head." The F/A was seated in a designated seat and required seven stitches. (No additional information is given in the CAMI files.)
10/28/76	7-1102	1M	During the taxi-out, a F/A received a minor cut on her head when she hit it on an open buffet door.

APPENDIX D

FLIGHT ATTENDANT IMPACT INJURIES IN SURVIVABLE ACCIDENTS 1971-1976

DESCRIPTIONS

Date	File No.	Injuries	Summary
03/03/72	1-0001	1S	This FH-227B crashed into a house while making an approach and sustained substantial structural damage. Fourteen passengers, two pilots, and one occupant of the house died in the accident. Thirty-one pax, the F/A and four occupants of the house were injured. The F/A seat support brace collapsed, the seat pan folded down, the right shoulder support failed outward and jammed between the lavatory wall and entry door opening mechanism; however, the seatbelt was intact. In addition, the F/A was found covered with carry-on baggage. She sustained serious head injuries.
05/18/72	1-0002	1S	This injury was suffered during impact. In addition to the F/A injury, there were one serious crew, one serious passenger, and four minor pax injuries. (There is no further information in CAMI files about the nature or causes of these injuries.)
12/08/72	1-0048	1S 2M	This B-737 crashed while a localizer approach for landing was being made. Forty of the 55 passengers sustained fatal injuries. The F/A seated in the jumpseat next to the forward pax door was trapped in her seat, pinned at her right arm and both legs. She sustained a laceration above the right eye, a burn above the left eye, multiple face abrasions, multiple chest contusion, fx of the distal end of the right radius, contusions and lacerations of the left hand, multiple contusions of the abdomen, burns on the upper back, sprain of the lower back, burns on the upper thighs, laceration of the right thigh,

multiple contusions of the knees, and a bilateral fx at the ankles. The two F/As seated in the rear of the aircraft had complaints of lung tightness and overall stiffness.

12/29/72	1-0016	2F 8S	"Of the 176 occupants - 5 crewmembers and 94 passengers were fatally injured." The surviving F/As (those with serious injuries) exhibited various severe injuries, the most prevalent of which were lower extremity fx. This L-1011 crashed while circling and sustained substantial structural damage.
11/27/73	1-0028	2M	The aircraft crashed while making an approach. The injuries were sustained during impact. The F/A who occupied the right side of the rear jumpseat sustained a lumbar strain, a sprained right ankle, an abrasion, and fuel irritation to the left eye. The F/A seated on the left side of the aft jumpseat sustained contusions to the left ankle and foot and to the right knee. Of the 74 passengers and crew of 5, 1 passenger and 2 flight deck crewmembers received serious injuries.
11/27/73	1-0029	2S	After landing the aircraft ran off the end of the runway. All the injuries occurred during impact. Both of the F/A seats collapsed and the aft jumpseat seatbelts failed. The NTSB Human Factors Report states that this restraint system failed at the fitting. There were 26 occupants: 16 received serious injuries, 9 received minor injuries, and only one was not injured. (There is no further information in CAMI files about the nature of these injuries.)
09/11/74	1-0020	1F 1M	This DC-9 crashed during the landing approach. The aircraft sustained substantial structural damage during impact and was almost completely destroyed in the subsequent fire. Of the 78 pax on board, 69 succumbed to fatal injuries as did one flight deck crewmember and one F/A. An

additional passenger succumbed to fatal injuries after being in the hospital for 29 days. The official cause of death for the F/A seated on the aft jumpseat was listed as smoke inhalation. The F/A seated on the forward jumpseat helped a passenger remove the first officer from the cockpit through the sliding window. (CAMI files do not contain information about the nature of her injuries except to say that they were minor.)

06/24/75	1-0006	2F 2S	This B-727 was involved in a landing accident and sustained substantial structural damage. Of the 113 pax, 107 sustained fatal injuries. Two of the four F/As and all three of the flight deck crew were killed. The two F/A fatalities were seated in the front of the aircraft and sustained injuries consistent with the severe head, chest, and lower limb injuries suffered by the fatally injured pax seated in the same area. The F/A who was seated on the left side of the aft jumpseat sustained a chip fracture of her right ankle and anterior fractures of L-1, L-2, and L-3 vertebrae. The F/A seated on the right side of the aft jumpseat sustained a fractured left rib, a contusion on the forehead, and a mild concussion.
08/07/75	1-0012	4S	This accident was an unforewarned emergency evacuation; however, the F/A injuries were sustained during impact. Both of the F/As on the aft jumpseat had submarined far enough to seriously bruise their backs. One F/A was trapped between the open edge of the door and the lavatory wall and was unable to unfasten her seatbelt/shoulder harness buckle. She suffered a chip fx of the greater trochanter of the head of the humerus of the left shoulder. The other F/A in the aft seat suffered multiple contusions and bruises. Her injuries were classified as serious based on time spent in the hospital (FAR 430 Section 430.2). The F/As in the forward, rear-facing jumpseats, were trapped between the coat closet forward wall and the cockpit bulkhead. The F/A on the left side of the seat suffered a fx of the left seventh rib, laceration of the right knee which had to

be sutured, and a sprained right foot. The F/A on the right side of the forward seat suffered a compression fx of the first lumbar vertebrae and contusions to the head. Ten pax and one flight deck crewmember were also injured during this accident.

08/30/75 1-0013 1S

This F-27B crashed into a mountain while attempting a landing. Seven of the 28 pax received fatal injuries as did the three cockpit crewmembers. Two of the 21 surviving pax escaped with only minor injuries. The 19 remaining pax received various impact injuries. The F/A had fractures of both legs and other impact injuries.

04/05/76 1-0003 2S
2M

During landing the aircraft over ran the runway, crashed, sustained substantial structural damage and was evacuated. The F/A seated in seat 6C suffered lacerations to both legs and abdominal bruises. The F/A seated in seat 8C sustained an acute cervical strain and rib fx on her right side. The F/A seated in 22C suffered contusions to the left arm, left knee, and head and also had fuel burns to his skin. The F/A in 22D sustained multiple contusions, fuel irritation to her right eye, and singed hair on the back of her head. Several of the pax and one flight deck crewmember also suffered serious injuries.

04/27/76 1-0005 2F
2S

In this landing accident the aircraft sustained substantial structural damage, but can still be considered an evacuation because some of the occupants left the aircraft directed by the F/As. The F/A seated on the jumpseat by the forward entry door had fx of all the major bones in her right arm and leg, "suggesting trauma" before receiving third degree burns over 84 percent of her body. The body of the F/A who had been seated on the right side of the aft jumpseat was charred. The trachea was black. The two surviving F/As suffered serious injuries.

The F/A seated in the mid-section of the aircraft sustained multiple bruises, burns, and fx of the right arm and shoulder. The F/A who was seated on the left side of the aft F/A seat sustained multiple bruises and fx at the right ankle. In addition, 28 pax were treated at the hospital and released. Eighteen pax were admitted to the hospital. Thirty-five pax were killed and three were not injured. The three flight deck crewmembers sustained minor injuries.

06/23/76

1-0011

2S

This airplane crashed during an unsuccessful attempt at a go-around. There was substantial structural damage; however, crewmembers directed the evacuation. It appears that all of the serious injuries were sustained during impact. The F/A in the front of the cabin reported she had gotten up to shut a galley drawer when impact occurred. She suffered a compression-type spinal fx. The F/A in the aft cabin sustained a contusion to her left ankle and leg, acute lumbosacral and cervical strains, and a lacerated tongue. In addition, 32 of the 98 pax and the two flight deck crewmembers sustained serious injuries.

APPENDIX E

ABBREVIATIONS AND DEFINITIONS

LIST OF ABBREVIATIONS

ALQ	Albuquerque International Airport, Albuquerque, New Mexico
B (as in B-727)	Boeing Aircraft Company
CAMI	Civil Aeromedical Institute
CAT	Clear air turbulence
DC	Douglas Aircraft Company
F/A	Flight attendant
F (as in F-27B)	Fairchild-Hiller Aircraft Corporation
F	Fatal injury
FAA	Federal Aviation Administration
Fx	Fracture
JFK	John F. Kennedy International Airport, Jamaica, New York
L (as in L-1011)	Lockheed Aircraft Company
LAX	Los Angeles International Airport, Los Angeles, California
M	Minor injury
NTSB	National Transportation Safety Board
PAX	Passenger
S	Serious injury

NOTE: Numbers in this report beginning with 1-(e.g. 1-0032) or N are NTSB file numbers; numbers beginning with 7 are CAMI file numbers.

DEFINITIONS

Definitions*

a. Aircraft accident - means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which any person suffers death or serious injury as a result of being in or upon the aircraft or anything attached thereto, or the aircraft receives substantial damage.

(1) Demolished - means damage to an aircraft to the extent that it would be impracticable to return the aircraft to an airworthy condition.

(2) Fatal injury - means any injury which results in death within 7 days.**

(3) Serious injury - means any injury which:

(a) Requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received.

(b) Results in a fracture of any bone except simple fractures of fingers, toes, or nose.

(c) Involves lacerations which cause severe hemorrhages, nerve, muscle, or tendon damage.

(d) Involves injury to any internal organ.

(e) Involves second or third degree burns, or any burns affecting more than 5 percent of the body surface.

(4) Substantial damage: Field inspectors are urged to fully consider all aspects of the exceptions in paragraph (b) before making a final "substantial damage" determination that would classify the occurrence as an accident.

(a) Except as provided in subparagraph (b) of this paragraph, substantial damage means damage or structural failure which adversely affects the structural strength, performance, or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component.

*Adapted from Order 8020.11, dated July 16, 1976, "Aircraft Accident and Incident Notification, Investigation, and Reporting," Department of Transportation, Federal Aviation Administration, pp. 7-10.

**Subsequent to completion of this analysis Change 7 to Order 8020.11 changed criteria of fatality from 7 days following an accident to 30 days.

(b) Exceptions: engine failure, damage limited to an engine, bent fairings, or cowlings, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wing tips are not considered "substantial damage."

b. Incident - means an aircraft occurrence, not classified as an accident, in which a hazard or potential hazard to safety is involved. For the purpose of notification, investigation, and reporting, the following will apply:

- (1) In-flight fire.
- (2) Rapid decompression requiring emergency action.
- (3) Unwanted or asymmetrical thrust reversal.
- (4) Flight control system malfunction or failure.
- (5) Inability of any required flight crewmember to perform his normal flight duties as a result of injury or illness.
- (6) Loss of life or serious injury which occurs as a result of personnel presence in or on an aircraft or in direct contact with the aircraft, or with anything attached thereto, during ground operations, while the engines are functioning without the intention of flight.
- (7) Substantial damage to the aircraft sustained during ground operations with the engines functioning with no intention of flight.
- (8) Turbine-engine rotor failures excluding compressor blades and turbine buckets.
- (9) Aircraft collide in flight with less than substantial damage with minor or no injuries.
- (10) Hazardous materials incidents.
- (11) Any significant occurrence related to aviation safety. This includes, but is not necessarily limited to, threats or acts of sabotage and aircraft hijacking.
- (12) In-flight total electrical failures for multiengine aircraft; in-flight total electrical failure for single-engine aircraft while under IFR weather conditions.
- (13) Near midair collisions.

c. Industry coordinator - means the coordinator approved by the NTSB to represent the operator, manufacturer, or another party to the investigation, who has technical knowledge or expertise which the Board feels should be included as a representative in the accident investigation.

d. Investigator-in-charge - means the NTSB person assigned to conduct an accident/incident investigation in accordance with appropriate NTSB regulations and the FAA investigator of PN-1 accidents.

e. Large aircraft - means aircraft of more than 12,500 pounds, maximum certificated takeoff weight.

f. Near midair collision - refers to an incident associated with the operation of an aircraft in which a possibility of collision occurs as a result of proximity of less than 500 feet to another aircraft, or a definite report is received from an aircrew member stating that a collision hazard existed between two or more aircraft.

g. Operation of aircraft or operate aircraft - means the use of aircraft for the purpose of air navigation and includes the navigation of aircraft. Any person who causes or authorizes the operation of aircraft, whether with or without the right or legal control (in the capacity of owner, lessee, or otherwise) of the aircraft, shall be deemed to be engaged in the operation of aircraft within the meaning of the Federal Aviation Act of 1958.

h. Operator - means any person who causes or authorizes the operation of an aircraft, such as the owner, lessee, or bailee of an aircraft.

i. Public use aircraft - means any aircraft used exclusively in the service of any government or of any political subdivisions thereof including the government of any state, territory, or possession of the United States, or the District of Columbia, but not including any government-owned aircraft engaged in carrying persons or property for commercial purposes.

j. Small aircraft - means aircraft of 12,500 pounds or less, maximum certificated takeoff weight.

k. Survivable accident - any accident in which the cabin is relatively intact, and if occupied by adequately restrained occupants, would not result in fatal injuries.

TURBULENCE REPORTING CRITERIA TABLE*

<i>Intensity</i>	<i>Aircraft Reaction</i>	<i>Reaction Inside Aircraft</i>	<i>Reporting Term</i> <i>Definition</i>
LIGHT	Turbulence that momentarily causes slight, erratic changes in altitude and/or attitude (pitch, roll, yaw). Report as <i>Light Turbulence</i> :*	Occupants may feel a slight strain against seat belts or shoulder straps. Unsecured objects may be displaced slightly. Food service may be conducted and little or no difficulty is encountered in walking.	Occasional—Less than 1/3 of the time.
	or		Intermittent—1/3 to 2/3.
	Turbulence that causes slight, rapid and somewhat rhythmic bumpiness without appreciable changes in altitude or attitude. Report as <i>Light Chop</i> .		Continuous—More than 2/3.
MODERATE	Turbulence that is similar to Light Turbulence but of greater intensity. Changes in altitude and/or attitude occur but the aircraft remains in positive control at all times. It usually causes variations in indicated airspeed. Report as <i>Moderate Turbulence</i> :*	Occupants feel definite strains against seat belts or shoulder straps. Unsecured objects are dislodged. Food service and walking are difficult.	NOTE —Pilots should report location(s), time (GMT), intensity, whether in or near clouds, altitude, type of aircraft and, when applicable, duration of turbulence.
	Turbulence that is similar to Light Chop but of greater intensity. It causes rapid bumps or jolts without appreciable changes in aircraft altitude or attitude. Report as <i>Moderate Chop</i> .		Duration may be based on time between two locations or over a single location. All locations should be readily identifiable. Example: a. Over Omaha, 1232Z, Moderate Turbulence, in cloud, Flight Level 310, B707. b. From 50 miles south of Albuquerque to 30 miles north of Phoenix, 1210Z to 1250Z, occasional Moderate Chop, Flight Level 330, DC8.
SEVERE	Turbulence that causes large, abrupt changes in altitude and/or attitude. It usually causes large variations in indicated airspeed. Aircraft may be momentarily out of control. Report as <i>Severe Turbulence</i> :*	Occupants are forced violently against seat belts or shoulder straps. Unsecured objects are tossed about. Food service and walking are impossible.	
EXTREME	Turbulence in which the aircraft is violently tossed about and is practically impossible to control. It may cause structural damage. Report as <i>Extreme Turbulence</i> :*		

* High level turbulence (normally above 15,000 feet ASL) not associated with cumuloform cloudiness, including thunderstorms, should be reported as CAT (clear air turbulence) preceded by the appropriate intensity, or light or moderate chop.

* U.S. Department of Transportation, Federal Aviation, Airman's Information Manual, January 1979, Basic Flight Information and ATC Procedures, Figure 4-1, page 102.

APPENDIX F

Sample Industry Reports of Flight Attendant Injuries

<u>DATE OF INCIDENT</u>			
10-1-71	DC-8		"F/A received a leg injury when aft jumpseat retracted too fast."
5-31-74	Type of Aircraft Unknown		"(OJI) report - Hostess was sitting on forward jumpseat and it completely fell - flight attendant injured. Report logged."
10-8-71	DC-8 61 Super		"Forward jumpseat fell off the wall during turbulence causing injury to the flight attendant."
6-16-71	CV-580		"Jumpseat collapsed while taxiing---Flight attendant injury."
10-8-71	CV-580		"Side facing aft jumpseat responsible for five injuries due to seat collapsing on takeoffs and landings."
10-8-71	FH 227		"Flight attendants injured when jumpseat collapsed."
11-3-71	FH 227		"F/A moved seat installed with red bar back and forth---it fell off. Mechanic says bar is no good due to the way it is attached."
4-27-75	Type of Aircraft Unknown		"Flight attendant injured when her jumpseat collapsed."

References

1. Training Manual, Part 28. Cabin Attendants; International Civil Aviation Organization, DOC 7192-AN/857, Montreal, Canada, 1967.
2. Air Carrier Cabin Safety: A Survey. Office of Aviation Safety, Federal Aviation Administration, Washington, D.C., December 1976.
3. Federal Aviation Act of 1958, Public Law 85-726, 85th Cong., 2nd Sess.; 72 Stat. 731; 49 U.S. Code 1301, August 23, 1958.
4. Department of Transportation Act, Public Law 89-670, 89th Cong., H.R. 15963, October 15, 1966.
5. Transportation Safety Act of 1974, Public Law 93-633, 93rd Cong., H.R. 15223, January 3, 1975.
6. National Transportation Safety Board Special Study, In-Flight Safety of Passengers and Flight Attendants Aboard Air Carrier Aircraft. NTSB report number AA-73-1, 1973.
7. Pollard, D. W., J. A. Anderson and R. J. Melton: A Description of the Civil Aeromedical Institute Airline Cabin Safety Data Bank: 1970-1976. FAA Office of Aviation Medicine report number AM-79-23, 1979.

*U.S. GOVERNMENT PRINTING OFFICE : 1982 O-370-332/809